

measuring parameter which is independent of the modulation can be supplied for example by a mechanical movement sensor. The set value can also be adjusted in dependence on the frequency, for example it can be
5 fixed during the rest state and then provided with a frequency-dependent slope.

Patent Claims

1. Cardiac pacemaker comprising a device for
10 producing successive stimulation pulses of a median duration of the stimulation interval, a device for modulating individual stimulation intervals (ESI) and a device for detecting a cardiac function parameter and for evaluating the changes in the cardiac function
15 parameter caused by said modulation, the stimulation interval duration being altered in dependence on the evaluated cardiac function parameter, **characterised in that**

the device for modulating the stimulation intervals
20 (551) alternately shortens and prolongs the stimulation intervals in such a way that the respective adjusted median stimulation interval duration does not change and the evaluation device determines the electric restitution of the heart at
25 this median stimulation interval duration on the basis of the measurement of the duration of the action potential, the changes in a measuring variable of the duration of the action potential caused by the modulation of individual stimulation intervals being
30 determined in relation to that in the median duration of the stimulation interval and being compared with at least one set value (ERGs), and in that the median duration of the stimulation interval is controlled on the basis of said comparison.

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2. Cardiac pacemaker according to claim 1, **characterised in that** the device for modulating

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individual stimulation intervals (ESI) carries out the alternating change repeating it periodically at intervals of a plurality of pulses.

3. Cardiac pacemaker according to claim 1,
5 **characterised in that** the device for modulating individual stimulation intervals (ESI) carries out the alternating change ($-\Delta\text{ESI}$, $+\Delta\text{ESI}$) continuously.

4. Cardiac pacemaker according to one of claims 1 to
10 3, **characterised in that**, as the measuring variable for determining the electric restitution, the duration of the action potential (APD) of the myocardium or the time interval between the stimulation pulse and the T wave in the ECG(ST) or the QRS complex and T wave in
15 the ECG(QT) is used.

5. Cardiac pacemaker according to one of claims 1 to
4, **characterised in that** the median value of the measuring variable (APDm, STm or QTm) determining the
20 electric restitution is calculated over a plurality of stimulation intervals.

6. Cardiac pacemaker according to one of claims 1 to
5, **characterised in that** the changes, dependent on the
25 respective change in the stimulation interval (ΔESI), of the measuring variable determining the electric restitution are stored and in that their median value (ΔAPDm or ΔSTm or ΔQTm) is determined over a plurality of change cycles.

7. Cardiac pacemaker according to one of claims 1 to
6, **characterised in that**, to evaluate the change in
the measuring variable, a dimensionless variable of
the 25 electric restitution is used.

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8. Cardiac pacemaker according to claim 7, **characterised in that**, as the dimensionless variable of the electric restitution, the gradient of the electric restitution (ERG) is calculated by forming the quotient $\Delta\text{APD}/\Delta\text{ESI}$ or $\Delta\text{STm}/\Delta\text{ESI}$ or $\Delta\text{QTm}/\Delta\text{ESI}$, or the relative change in the electric restitution by forming the quotient $\Delta\text{APDm}/\text{APDm}$ or $\Delta\text{STm}/\text{STm}$ or $\Delta\text{QTm}/\text{QTm}$.

9. Cardiac pacemaker according to claim 1 to 8, **characterised in that** the set value (ERGs) is predetermined by the value of the gradient or of the relative change in the electric restitution in the body's state of rest.

10. Cardiac pacemaker according to claim 5, **characterised in that**, in order to adapt the set value (ERGs) to individual fluctuations in the electric restitution, the median duration of the stimulation interval is fixed by external programming in the patient's state of rest and the value measured in this rest phase is stored as an absolute set value (ERGs).

11. Cardiac pacemaker according to claim 9, **characterised in that**, in order to adapt the set value (ERGs) to longer-term fluctuations of the electric restitution, the rest state of the patient is recognised by means of a sensor and the median duration of the stimulation interval is adjusted and the stored set value (ERGs) is replaced by the value measured in the detected rest phase.

12. Cardiac pacemaker according to one of claims 1 to 9, **characterised in that**, to compensate for the frequency-dependent changes in the detection of the T waves, the set value (ERGs) is altered in dependence on the duration of the stimulation interval.

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13. Cardiac pacemaker according to one of claims 1 to
8, **characterised in that** the median duration of the
stimulation interval is controlled in such a way that
it rises if the difference between the restitution 30
5 gradient and the set value falls below a negative
threshold value and drops if the difference exceeds a
positive threshold value.

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